

VU Research Portal

Behavioural Economic Studies of Flood Insurance Demand

Robinson, P.J.

2020

document version

Publisher's PDF, also known as Version of record

[Link to publication in VU Research Portal](#)

citation for published version (APA)

Robinson, P. J. (2020). *Behavioural Economic Studies of Flood Insurance Demand*. [PhD-Thesis - Research and graduation internal, Vrije Universiteit Amsterdam].

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal ?

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

E-mail address:

vuresearchportal.ub@vu.nl

Table of Contents

1. Introduction.....	1
1.1 Flood risk in Europe and the Netherlands.....	2
1.2 Insuring flood risk.....	4
1.3 Theory, insufficient demand for flood insurance and knowledge gaps	5
1.4 Research questions.....	14
1.5 Methods and outline of the thesis	15
2. Economic experiments, hypothetical surveys and market data studies of insurance demand against low-probability/high-impact risks: A systematic review of designs, theoretical insights and determinants of demand	21
2.1 Introduction.....	22
2.2 Literature review method.....	24
2.3 Study and insurance characteristics	26
2.4 Results about theories of decision making under risk, uncertainty and ambiguity	38
2.5 Results about heuristics and behavioural biases	51
2.6 Variables explaining insurance demand	54
2.7 Conclusion	60
3. An experimental study of charity hazard: The effect of risky and ambiguous government compensation on flood insurance demand	63
3.1 Introduction.....	64
3.2 Theory and hypotheses	69
3.3 Experiment.....	75
3.4 Experiment results	86

3.5	Discussion	96
3.6	Conclusion	100
4.	The impact of regret and worry on the threshold level of concern for flood insurance demand: Evidence from Dutch homeowners	101
4.1	Introduction.....	102
4.2	Experiment implementation and variable elicitation and description.....	103
4.3	Results.....	108
4.4	Discussion	112
5.	Determinants of probability neglect and risk attitudes for disaster risk: An online experimental study of flood insurance demand among homeowners	115
5.1	Introduction.....	116
5.2	Motivation and hypotheses	117
5.3	Implementation and experiment design	121
5.4	Method and main results	125
5.5	Discussion	132
5.6	Conclusion	135
6.	Flood insurance demand and probability weighting: The influences of regret, worry, locus of control and the threshold of concern heuristic.....	137
6.1	Introduction.....	138
6.2	Implementation and experiment design	141
6.3	Methods.....	152
6.4	Results.....	155
6.5	Discussion	164

6.6 Conclusion	167
7. Default options and insurance demand.....	169
7.1 Introduction.....	170
7.2 Institutional design and comparison	172
7.3 Hypotheses.....	174
7.4 Survey design and descriptive statistics.....	178
7.5 Results.....	185
7.6 Discussion	197
7.7 Conclusion	199
8. Conclusion	201
8.1 Background and research questions.....	202
8.2 Conclusions with respect to underinsurance against flood risk	206
8.3 Conclusions with respect to improving individual preparedness for flooding	211
8.4 Conclusions with respect to incentivizing experimental insurance decisions against LPHI risk	212
8.5 Policy recommendations and limitations of the research	214
8.6 Directions for future research	215
Appendix A	217
Appendix B.....	247
Appendix C	273
References	277
Summary in English.....	309
Summary in Dutch	315

SENSE diploma	323
----------------------------	------------

List of figures

1.1 Overview of the chapters of the thesis.....	19
3.1 Mean insurance purchases under flooding probabilities (p) 0.001, 0.01 and 0.1, per government compensation version and loading factor (λ) 0.5, 0.75, 1 and 4	88
4.1 Distribution of Likert scale responses for anticipated regret and anticipatory worry	108
6.1 Flood insurance decision stage 1 screenshot.....	146
6.2 Flood insurance decision stage 2 screenshot.....	146
6.3 Distribution of Likert scale responses for the hypothesis variables.....	156
7.1 Flood insurance demand elicitation over the opt-in and opt-out conditions	180
7.2 Default effect between the Netherlands ($UK = 0$) and the UK ($UK = 1$).....	189
7.3 Default effect within the UK over whether subjects report to currently hold flood insurance (hold insurance = 1) and not (hold insurance = 0), whether subjects report to have held flood insurance in the past (held insurance = 1) and not (held insurance = 0), and whether subjects report to have been flooded in the past (flooding experience = 1) and not (flooding experience = 0)	190
7.4 Marginal effect of opt-out on the likelihood of flood insurance purchase across levels of risk preference within the Netherlands and the UK; higher (lower) values represent more risk seeking (aversion)	191
A1-1 Welfare gain of full insurance in currency units (CU) across constant relative risk aversion coefficients (r) and loading factors (λ) under no government compensation and low probability of loss	218
A1-2 Welfare gain of full insurance in currency units (CU) across constant relative risk aversion coefficients (r) and loading factors (λ) under no government compensation and high probability of loss.....	219

A1-3 Welfare gain of full insurance in currency units (CU) across constant relative risk aversion coefficients (r) and loading factors (λ) under certain half government compensation and low probability of loss	220
A1-4 Welfare gain of full insurance in currency units (CU) across constant relative risk aversion coefficients (r) and loading factors (λ) under risky full government compensation and low probability of loss	221
A1-5 Welfare gain of full insurance in currency units (CU) across constant relative ambiguity aversion coefficients (α) under ambiguous full government compensation, low probability of loss, loading factor 0.5 and risk neutral preferences.....	222
A3-1 Distributions of risk and ambiguity preferences in the gain and loss domain with the MPL tasks.....	243
A3-2 Distribution of stated risk preference	244
C1 Distribution of risk preference in the Netherlands and the UK	273
C2 Distribution of regret in the Netherlands and the UK.....	274
C3 Distribution of insurance cost in the Netherlands and the UK.....	275
C4 Distribution of trust in the Netherlands and the UK.....	276

List of tables

2.1 Type of study, country where the study was conducted, sample types used and insurance conditions (insurance context, deductibles and loading factors)	27
2.2 Studies of insurance demand using market data	32
2.3 Main results per study and support provided for theories, heuristics and behavioural biases	39
2.4 Variables incorporated per study and their effect on insurance demand	55
3.1 Multiple price list used to elicit risk preferences in the loss domain, with the probability (Pr.) of outcomes in currency units (CU) and expected value (EV) differences as well as loss domain risk preference parameters (<i>b</i>)	79
3.2 Multiple price list used to elicit ambiguity preferences in the loss domain, with outcomes in currency units (CU) and loss domain ambiguity preference parameters (<i>c</i>)	80
3.3 Distribution of subjects over the experiment versions	85
3.4 Flood insurance purchase decisions	85
3.5 Percentage difference in insurance purchase under the different conditions of government compensation relative to the baseline (no government compensation condition)	90
3.6 Random effects Probit regression of variables of influence on flood insurance purchases with risk and ambiguity preferences elicited in the gain domain.....	94
3.7 Summary of hypotheses results	98
4.1 Probability and loss combinations presented for the flood insurance decisions	105
4.2 Coding of the dependent variable (threshold): the number of successive times individuals accepted the flood risk and remained uninsured	106
4.3 Correlation coefficients between variables	109

4.4 OLS regression results.....	111
4.5 OLS regression results excluding stochastic dominance violators	111
5.1 Hypotheses	121
5.2 Variables included in the analysis	127
5.3 Regression results of the influence of variables of interest on flood insurance demand.....	131
6.1 Descriptive statistics.....	143
6.2 Prospects	145
6.3 Relative risk premia (RRP) difference per variable of interest.....	159
6.4 Maximum likelihood estimation results (probability weighting parameters are a function of variables of interest)	162
6.5 Maximum likelihood estimation results (utility parameter is a function of variables of interest)	163
7.1 Summary of survey conditions	181
7.2 Summary of variables by country	184
7.3 Probit model of the likelihood of flood insurance purchase	194
7.4 Decomposition of total effect of opt-out on flood insurance demand into direct effect and indirect effect via regret and insurance cost in the Netherlands using the Probit model	197
A3-1 Descriptive statistics and coding of the dependent and independent variables	242
A4-1 Random effects Probit regression of variables of influence on flood insurance purchases with risk and ambiguity preferences elicited in the loss domain.....	245